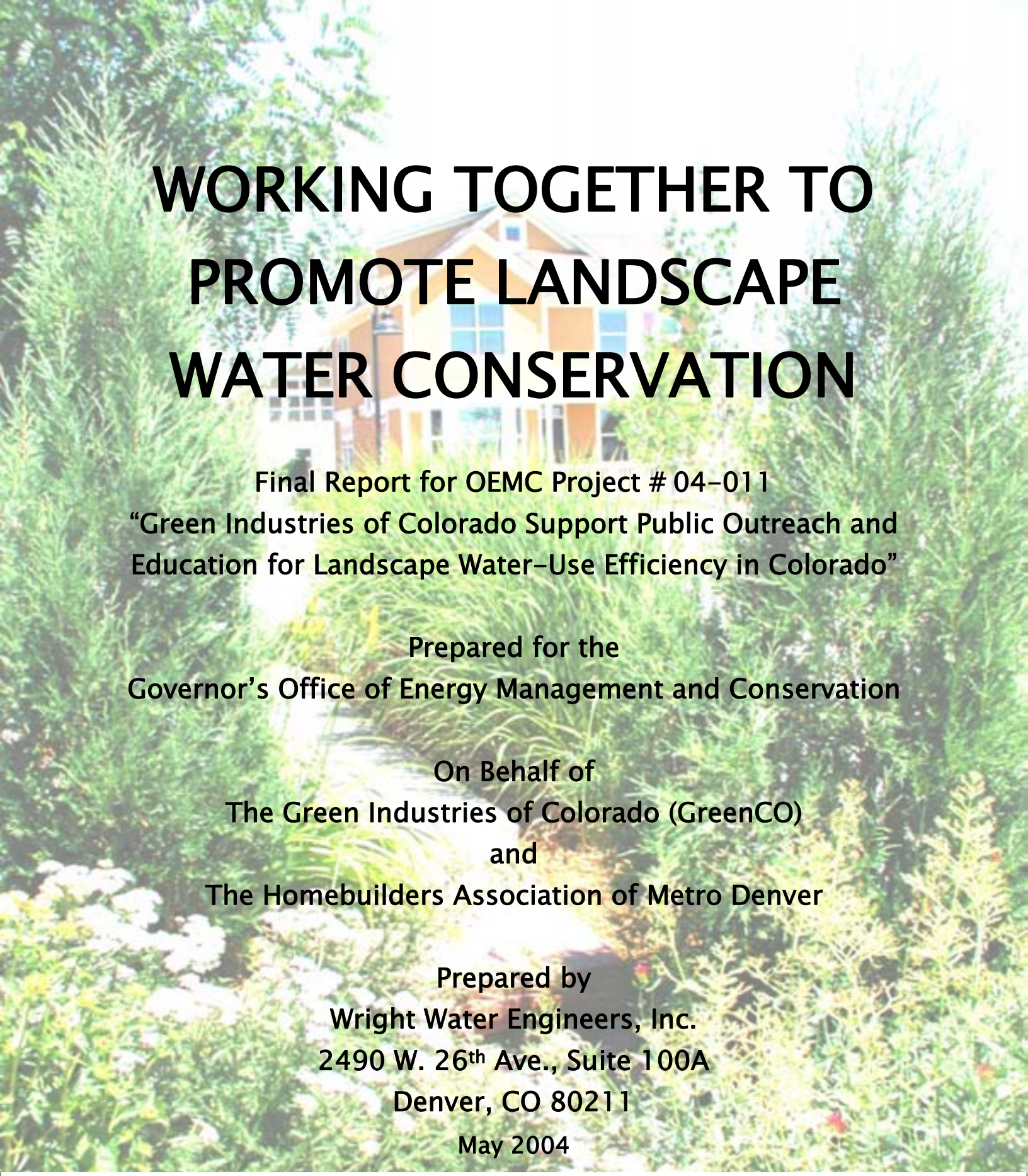

WORKING TOGETHER TO PROMOTE LANDSCAPE WATER CONSERVATION

Final Report for OEMC Project # 04-011
"Green Industries of Colorado Support Public Outreach and Education for Landscape Water-Use Efficiency in Colorado"

Prepared for the
Governor's Office of Energy Management and Conservation

On Behalf of
The Green Industries of Colorado (GreenCO)
and
The Homebuilders Association of Metro Denver

Prepared by
Wright Water Engineers, Inc.
2490 W. 26th Ave., Suite 100A
Denver, CO 80211

May 2004

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HOME BUILDERS ASSOCIATION OF METRO DENVER

BUILT GREEN® It's Everybody's Home

colorado Governor's Office of Energy Management and Conservation

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Attachments

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WORKING TOGETHER TO PROMOTE LANDSCAPE WATER CONSERVATION

PROJECT OVERVIEW

During 2003-2004, the Governor's Office of Energy Management and Conservation (OEMC) provided a grant to the Green Industries of Colorado (GreenCO), working with the Homebuilders Association of Metro Denver (HBA), to promote landscape-related water conservation and water quality protection at new homes and developments. The primary goals of the project included:

- Engage homebuilders and developers in the promotion and implementation of landscape water conservation guidelines.
- Develop partnerships with water providers to increase landscape water conservation.
- "Spread the word" about BMPs and landscape-related water-use efficiency.
- Offer practical tools and resources to increase water use efficiency outdoors.

The final report provides an overview of the work completed to further these goals including:

- Description of GreenCO's and HBA's landscape water conservation programs.
- Tabulation of builder survey results assessing interest in landscape water conservation.
- Description of case studies of builder landscape water conservation practices.
- Identification of water conservation training opportunities with builders.
- Implementation of training and educational opportunities through:
    - Recommended changes to the Built Green® Checklist.
    - Educational materials provided for the Quality Construction Manual.
    - Builder Product Night presentation.

- Publications in periodicals.

- Identification of Future Opportunities.

BACKGROUND AND DESCRIPTIONS OF GREENCO'S AND HBA'S LANDSCAPE WATER CONSERVATION PROGRAMS AND POLICIES

Background

Both GreenCO's and the HBA's members are directly affected by the significant challenges of water shortages exacerbated by the drought and a rapidly increasing population. Water quantity and quality issues are highly publicized and political, particularly as a result of the last several years of drought conditions. Public awareness about water conservation is severely lacking, evidenced by the fact that many homeowners with in-ground irrigation systems over-water their landscapes. As an example of the extent of this over-watering, Wright Water Engineers compiled data at three residential developments where builders had been sued due to structural damage, wet basements and poor drainage. Gross over-watering, as shown in Table 1, was a key cause of this damage. Not only do these practices waste water and money, there can be additional consequences for builders, as in the case of these three lawsuits.

Table 1
Case Studies of Irrigation Rates at Three Front Range Homeowners Associations
(Data Source: Wright Water Engineers, Inc., 2003)

Case	Estimated Irrigation Requirement (inches/year)	Documented Annual Irrigation (inches/year)	Average Annual % of Irrigation Requirement	Annual Irrigation Water Waste (inches/year)
Case #1 Colorado Springs HOA-a	29	52.5 during 1999 73.1 during 2000 **Average: 62.8**	217%	33.8
Case #2 Colorado Springs HOA-b	29	Range of 58-91 during 1998-2001 **Average: 76**	262%	47
Case #3 Arvada HOA	29	During 2000-2001 **Average: 79.9**	276%	50.9

Water shortages in Colorado are and will continue to be a pervasive problem for both the industry and homeowners. The fact that over half of treated water along the Front Range currently goes to landscape irrigation means that landscaping and landscape-related businesses will be adversely impacted by water shortages related to current and future droughts. In addition, population growth rates along the Front Range, some of the highest in the nation, have put enormous pressure on the state's limited water resources. This problem affects both the Green Industry and homebuilders.

As GreenCO has worked within its own industry for the past few years to develop and promote water conservation, it has also recognized the critical importance of partnering with developers and homebuilders because they influence the types of landscapes installed at new homes. The HBA has also worked with its membership to promote both indoor and outdoor water conservation through a variety of programs. One of the goals of this project was to increase the consistency and extent of landscape water conservation practices between the HBA and GreenCO. In order to identify opportunities for improvement in these approaches, it was first necessary to document what opportunities builders have to influence landscape water conservation as shown in Table 2. The next step was to identify what practices and programs GreenCO and HBA are implementing.

Table 2
Summary of Opportunities for Builders to Promote Landscape Water Conservation

Individual Lots			Common Areas	Covenants
No Landscape or Irrigation Installation	Landscape Installation Only (no irrigation system)	Landscape and Irrigation Installation	Interim Management/ Maintenance	Establishing HOA Covenants
Provide educational brochures to buyers and demonstrate practices at model homes.	Properly design and install water-wise landscapes and educate homeowner on proper maintenance.	Properly design and install water-wise landscapes and irrigation systems. Educate homeowner on proper maintenance.	Properly design, install and maintain water-wise landscapes and irrigation systems during interim management.	Set water-wise landscape and irrigation standards.

GreenCO Landscape Water Conservation Practices

GreenCO is an umbrella trade organization representing the common interests of nine landscape-related trades. With over 1,500 member companies, GreenCO represents diverse interests from landscape architects and contractors to nurseries and sod growers. Each of GreenCO's members has in common an economic dependence on built landscapes. In 1996, GreenCO began aggressively working to understand and respond to challenges posed by water shortages resulting from drought and population growth. GreenCO has recognized that for successful landscape water conservation to occur, it is critical to work with diverse partners such as the HBA, Denver Water, Colorado State University Cooperative Extension, Colorado WaterWise Council and others.

The foundation of GreenCO's current water conservation and water quality practices is the manual titled *Green Industry Best Management Practices (BMPs) for the Conservation and Protection of Water Resources in Colorado,* which was originally released in 2002 and has recently been revised and re-released in May 2004 (GreenCO and Wright Water Engineers, 2004). The term "Best Management Practices" (BMPs) refers to nursery, retail and landscape design, installation, maintenance and operation methods that have been identified as efficient and effective approaches for water conservation and water quality protection. The industry-wide BMP project encourages conservation through responsible water management practices for both industry professionals and consumers. The manual, which includes 31 specific practices, is available from the GreenCO website (www.greenco.org), as well as on a CD-ROM and in a hard-copy notebook. GreenCO is initiating a companion training program on the BMPs for Green Industry professionals that will provide recognition for those that complete the course. Homebuilders desiring to work with Green Industry professionals that have completed this training will be able to identify these individuals on GreenCO's website in the future. Table 3 provides a summary list of the GreenCO BMPs relevant to builders, along with brief descriptions of these practices and their potential applicability to builders.

Table 3 *(continues through page 7)*

Summary of GreenCO BMPs and Relevance to Builders

GreenCO BMP	Overview of BMP	Individual Lots			Common Areas	Covenants
		No Landscape/ Irrigation Installation	Landscape Installation Only (no irrigation system)	Landscape and Irrigation Installation	Interim Management/ Maintenance	Establishing HOA Covenants (factors to consider)
Drought/ Conservation Practices for Landscapes	Manage landscapes using the most water-efficient techniques during drought conditions.				X	X
Education of Employees	Educate industry employees on water quality and water conservation practices.	X	X	X	X	X
Education of the Public	Model and teach water conservation and water pollution prevention to the general public and consumers of green industry products.	X	X	X	X	X
Herbaceous Plant Care	Properly plant and maintain herbaceous plants to maximize plant health and conserve water.		X	X	X	X
Fertilizer Application	Properly apply fertilizers, based on the specific needs of plants, particularly as identified by appropriate soil or plant tissue tests.		X	X	X	X
Irrigation Efficiency	Properly design, install and maintain irrigation systems to ensure uniform and efficient distribution of water, thereby conserving water and protecting water resources.			X	X	X
Irrigation System Design	Design the irrigation system for the efficient and uniform distribution of water.			X	X	X
Irrigation System Installation	Install the irrigation system according to the irrigation design specifications, which should be in accordance with manufacturer's specifications, local code requirements and sound principles of efficient and uniform water distribution.			X	X	X
Irrigation System Maintenance	Maintain the irrigation system for optimum performance, ensuring efficient and uniform distribution of water. Modify the irrigation system as needed to provide supplemental water for maintaining healthy plants without wasting water.				X	X
Landscape Design	Plan and design landscaping comprehensively to conserve water and protect water quality.		X	X	X	X

Table 3 *(continues through page 7)*

Summary of GreenCO BMPs and Relevance to Builders

GreenCO BMP	Overview of BMP	Individual Lots			Common Areas	Covenants
		No Landscape/ Irrigation Installation	Landscape Installation Only (no irrigation system)	Landscape and Irrigation Installation	Interim Management/ Maintenance	Establishing HOA Covenants (factors to consider)
Landscape Installation/ Erosion and Sediment Control	Minimize erosion and control sediment leaving the construction site during landscape installation.		X	X	X	X
Landscape Maintenance	Practice appropriate landscape maintenance. Proper pruning, weeding and fertilization, as well as attention to the irrigation system are needed.				X	X
Lawn Aeration	Aerate lawns to reduce thatch, thereby improving nutrient and water uptake, reducing runoff and reducing compaction.				X	X
Lawn Waste Disposal/Composting	Dispose of lawn waste to minimize adverse impacts to the environment by keeping lawn waste out of storm drains and recycling organic materials whenever possible.				X	X
Mowing	Mow lawns to the proper height and at the proper frequency to maintain turfgrass health, thereby minimizing the need for pesticide and fertilizer application and reducing water usage.				X	X
Mulching	Use organic mulches to reduce water loss through evapotranspiration, to reduce soil loss due to exposure to wind and runoff, to suppress weeds, and to provide a more uniform soil temperature.		X	X	X	X
Park, Golf Course and Other Large Landscape Design and Management	Large landscaped areas such as parks and golf courses should be well designed and properly managed to be an environmental amenity and to minimize runoff to waterbodies.				X	X
Pesticide and Herbicide Application	Apply pesticides at minimal levels in accordance with the label and targeted to specific plant problems.		X	X	X	X
Pesticide, Fertilizer and Other Chemical Storage, Handling and Disposal	Pesticides, herbicides, fertilizers, fuel and other maintenance chemicals must be properly applied, stored, handled and disposed of to prevent contamination of surface water and groundwater.		X	X	X	X

Table 3 *(continues through page 7)*

Summary of GreenCO BMPs and Relevance to Builders

GreenCO BMP	Overview of BMP	Individual Lots			Common Areas	Covenants
		No Landscape/ Irrigation Installation	Landscape Installation Only (no irrigation system)	Landscape and Irrigation Installation	Interim Management/ Maintenance	Establishing HOA Covenants (factors to consider)
Plant Selection and Placement	Select appropriate plants and group according to their water needs (i.e., "hydrozoning").		X	X	X	X
Regulatory Awareness	A variety of local, state and federal environmental regulations impact landscaping and nursery operations. Green industry professional should be aware of these regulations and comply with their requirements.	X	X	X	X	X
Revegetation of Drainageways	Establishment of a robust cover of vegetation is critical to the proper functioning of engineered drainage structures such as grass-lined channels, detention basins, retention ponds, and wetlands.	X	X	X	X	X
Riparian Zones	Preserve wide, undisturbed natural riparian areas along streams.	X	X	X	X	X
Soil Amendment/ Ground Preparation	Evaluate soil and improve, if necessary, to promote efficient water usage and healthy plants.	X	X	X	X	X
Turf Management	Plan practical turf areas and properly install and maintain these areas.		X	X	X	X
Water Budgeting	Calculate the water needs of irrigated landscapes based on plant types, land area and irrigation system efficiency. Use the calculated water budget to apply water according to the needs of the plants and manage irrigation.		X	X	X	X
Woody Plant Care	Properly plant and maintain prune or trim trees, shrubs and other woody plants to maximize the plants' health.	X	X	X	X	X
Xeriscape	Implement the seven basic landscape principles of xeriscape: planning and design, soil improvement, zoning of plants, practical turf areas, efficient irrigation, mulching and appropriate maintenance.		X	X	X	X

Overview of the Homebuilders Association of Metro Denver Landscape-Related Water Policies

The HBA of Metro Denver recognizes the importance of both water conservation and water quality protection. The recent severe drought conditions and increasingly stringent water quality regulations under the Phase II stormwater regulation have brought these issues to the forefront. With this in mind, HBA has pursued a multi-pronged approach to these issues including the Built Green® Colorado Program, the Quality Construction Certification educational series and accompanying manual, the HBA Policy on Water, the HBA Water-Wise Plan, educational articles in *Homebuilder Magazine,* an on-going series of seminars on stormwater management and soil erosion control, and most recently, partnering with GreenCO through this project. Brief descriptions of each component of HBA's programs that address landscape water conservation follow.

First, the Built Green® Colorado Program provides an opportunity for homebuilders committed to natural resource conservation and protection to receive recognition for their efforts based on a point system for specific practices on the Built Green® Checklist. Introduced in 1995, Built Green® Colorado was created through the joint efforts of the HBA, OEMC, Xcel Energy, and E-Star Colorado. The purpose of Built Green® Colorado is to encourage homebuilders to use technologies, products and practices that will:

- Provide greater energy efficiency and reduce pollution
- Provide healthier indoor air
- Reduce water usage
- Preserve natural resources
- Improve durability and reduce maintenance

The landscaping practices on the 2004 Built Green® Checklist are listed in Table 4.

Table 4
Landscaping Practices Included on the 2004 Built Green® Checklist

Practice ID	Built Green® Checklist Criteria Relevant to Landscaping
IXX. RESOURCE CONSERVATION: LAND USE	
179	Trees and natural features on site protected during construction.
180	Save and reuse all site topsoil where determined valuable by soil analysis.
XXII. RESOURCE CONSERVATION: WATER	
196	Installed irrigation system includes a soil moisture or rain sensor, or other irrigation efficiency device (examples in Guide to the Built Green® Checklist).
197	Install at least three cubic yards of soil amendment per 1000 square feet of installed landscape area, based on soil analysis.
198	Installed irrigation system is zoned separately for turf and bedding areas, and meets low-volume, non-spray irrigation standards, which includes bubblers and drip emitters, drip irrigation, soaker hose and subsurface irrigation. Does not include micro-spray irrigation.
199	Less than 50% of installed landscape is cool season turf grass (fescue or bluegrass); remaining landscape area either dedicated to water-wise planting beds or to outdoor living environments.
200	Principles of Xeriscape are applied to non-turf areas of landscaping. See http://www.water.denver.co.gov/xeriscapeinfo/xeriscapeframe.html for details.
202	Areas planted with turf should not exceed a maximum slope of 25%.
203	Installed bedding areas are mulched to a depth of 3".
204	Permeable materials comprise 40% of areas for all walkways, patios and driveways.
205	Recycled-content mulch or compost.
206	Rainwater harvested and directed toward landscaping needs where practical.
207	Provide a list of drought tolerant plants to homebuyers, and add an additional point if builder incorporates water-wise landscaping on model.
208	Provide homebuyers with at least 3 sample water-wise landscaping and irrigation sketch plans (when landscaping is not installed).

In addition to the Built Green® Colorado program, the HBA also provides a Quality Construction training course for site supervisors semi-annually. The course includes a notebook of information on a variety of topics. The landscaping and water usage information in the notebook emphasizes the importance of the builder working closely with the landscape contractor. The manual provides a landscaping checklist for the builder that includes topics such as use of mulches, zoning of plants, soil improvements, efficient irrigation and other water-wise measures. The manual also provides a list of helpful tips for homebuyers with regard to water-conservation practices for home landscaping.

Given the strong relationship between landscape water conservation and water quality, it is also important to note that since early 2002, the HBA has periodically offered seminars on complying with the Phase II Stormwater Regulations. In recent years, the frequency of the course offerings has increased, as has the level of detail regarding

compliance. The HBA typically collaborates on these seminars with other trade associations with affected memberships, as well as the local, state and national regulatory bodies.

Finally, in 2002, the HBA developed a water policy as stated in Exhibit 1.

Exhibit 1. HBA of Metro Denver Water Policy (HBA 2002).

The Home Builders Association of Metro Denver (HBA) acknowledges that water is a precious resource in Colorado. In recognition of this, the HBA will be proactive in developing both short term and long term strategies to address the ongoing need for efficient water resource management and the development of new water resources.

1. The HBA will examine its industry's areas of direct impact and develop programs and strategies for the efficient use of water in residential land development and construction.
2. The HBA will promote the most effective water-wise practices and latest water efficient technologies to its members and to the public.
3. The HBA will promote the need for water conservation and encourage local jurisdictions to develop or amend existing regulations to be consistent with recognized and evolving water-wise practices.
4. The HBA in conjunction with the Colorado Association of Home Builders and a broad-based coalition will actively support the improvement of existing and the development of new water resources.

In 2003, the HBA Water Task Force further developed the water policy by creating a water-wise template addressing both indoor and outdoor water conservation, as shown in Table 5. Many of these practices are consistent with the information in the Built Green® Checklist.

Table 5
HBA Water-Wise Template (Approved by HBA Board, February, 2003)

	INDOOR WATER-WISE MEASURES, NEW CONSTRUCTION	COMMENTS
1	Install aerators on bathroom faucets restricting flow to 1.8 or less gpm	2.5 gpm is Fed requirement. Average use is 10.9 gcd
2a	Install 2.0 gpm or less shower heads	Federal requirement is 2.5 gpm at 80 psi
2b	**OR** Install venturi or aspirator valve ahead of standard shower head to reduce flow to 2.0 or less.	Federal requirement is 2.5 gpm at 80 psi
3	Install dishwasher that uses 6.0 gal or less per normal load	Most Energy Star® designated dishwashers will meet this
OUTDOOR WATER-WISE MEASURES, NEW CONSTRUCTION, IMPLEMENTED BY BUILDER, PRIVATE FRONT LOT APPLICATION (INCLUDE SIDE YARDS ON CORNER LOTS)		
1	Builder installed landscaping includes soil prep with three cubic yards of soil amendment per 1,000 square feet of installed landscape area	Proper soil preparation is the single most significant factor in the ability of the soil to absorb, retain and release water to vegetation.
2	Builder installed irrigation system includes a soil moisture, rain sensor or other irrigation efficiency device	A variety of types of irrigation efficiency devices are available ranging from ones that will override the timer during rain or at times of adequate soil moisture, as well as water budgeting devices that will automatically cut back water application to a set percentage reduction.
3	Builder installed irrigation system is zoned separately for turf and bedding areas	Separate zoning to meet the different water needs of plantings reduces water waste
4	Builder installed irrigation system uses drip irrigation in appropriate bedding areas	Drip irrigation delivers water to plantings without evaporative losses
5	Builder installed landscaping includes turf area not exceeding 50% of permeable area of lot[1]	Permeable area excludes house footprint, sidewalks, driveways, etc.
6a	When front AND rear lot landscaping and irrigation is installed, the builder will adhere to water-wise landscape principles	Water-wise landscape principles are the principles of Xeriscape. Visit www.denverwater.org

Table 5 (continued)

6b	**OR** When only front lot landscaping and irrigation is installed by builder, builder will provide buyers 3-5 sample water-wise landscape templates, including appropriate efficient irrigation plans, for the rear lot	Buyer education and encouragement to install water-wise landscaping. Water-wise landscape principles are the principles of Xeriscape. Visit www.denverwater.org
6c	**OR** Where builder installs front lot landscaping but NOT front irrigation, prior to installation of landscaping buyers will be provided an appropriate efficient irrigation plan for planned front lot landscaping. Builder will also provide buyer 3-5 sample water-wise landscape templates, including appropriate efficient irrigation plans, for the rear lot.	Buyer education and encouragement to install water-wise landscaping. Water-wise landscape principles are the principles of Xeriscape. Visit www.denverwater.org
6d	**OR** When NO landscaping or irrigation is installed by builder, builder will advise buyers to install soil amendments prior to landscaping and will provide buyer 3-5 sample water-wise landscape templates, including appropriate efficient irrigation plans, for both the front and rear lots	Buyer education and encouragement to install water-wise landscaping. Water-wise landscape principles are the principles of Xeriscape. Visit www.denverwater.org
7	Builder advises all buyers on the severity of the drought and advises buyers that water rate surcharges and/or special rate structures may be in effect or planned by individual water districts until reservoir capacities reach 80%.	Educate buyer on cost impacts of their water use; price point signals result in greater conservation.

[1] Note on Turf Limits: At the time this template was developed, Denver Water was promoting turf limits in a model ordinance; however, Denver Water is no longer promoting a percent turf limit for a variety of reasons. Instead, the Xeriscape principle of practical turf areas is encouraged. Similarly, GreenCO does not endorse turf limits; instead, GreenCO promotes water budgeting in combination with the Xeriscape principle of practical turf areas. The HBA is considering revising the water-wise template to align with the principle of practical turf areas.

SURVEY OF HOMEBUILDERS: HOW INTERESTED ARE BUILDERS IN LANDSCAPE WATER CONSERVATION?

In order to better assess builder interest and practices with regard to landscape water conservation, an e-mail survey was distributed to 450 HBA member companies. About 29 companies responded to the survey. Just over half (60%) of those responding were Built Green® builders. The survey contained seven multiple-choice questions, addressing these topics:

1. Characterization of the builder's current landscape water conservation practices.
2. Assessment of level of interest in water conservation-oriented specifications and/or guidance.
3. Assessment of interest in brochures for new homebuyers on these water conservation topics.
4. Identification of which Built Green®/HBA recommended practices were frequently implemented.
5. Determination of whether cost/benefit data were available for practices that were implemented.
6. Assessment of interest in attending a water conservation/landscaping-related presentation as a standard educational course offering of the HBA.
7. Determination of whether the survey responder was a Built Green® Colorado member.

The survey results indicated a wide range in builder approaches to landscape water conservation as shown in responses to questions 1-5 in Table 6.

Table 6. Builder Landscape Water Conservation Survey

Survey Topic	Response Option	% Yes Res-ponse
Current Landscape Water Conservation Policies/ Practices	A. No policies or practice guidelines in place related to water conservation. We follow the guidance of the local government.	31%
	B. Where we don't install individual lot landscaping we encourage Xeriscape and other water-wise practices by providing educational materials to buyers and/or model these practices at our model homes.	17%
	C. Where we do install individual lot landscaping we provide water-conservation oriented specifications for irrigation systems, soil amendment and/or landscape design.	28%
	D. We provide water-conservation oriented specifications for irrigation systems, soil amendment and/or landscape design for common areas/parks.	28%
	E. We provide water-conservation oriented specifications for common area/park landscape maintenance.	17%
	F. We have written company policies that provide specific guidance on water conserving landscape practices in common areas and individual lots.	14%
	G. Other: (describe)	0%
Interest in water conservation-oriented specifications and/or guidance	A. Soil Amendment	59%
	B. Irrigation System Design	52%
	C. Irrigation System Installation	45%
	D. Model Landscape Maintenance Contract	34%
	E. Tree Protection During Construction	55%
	F. Turf Installation	48%
	G. Water Budgeting	45%
	H. Other: (describe)	0%
Interest in brochures on these water conservation topics to provide to homebuyers:	A. Xeriscaping	66%
	B. Lawn Care (proper watering, mowing, irrigation, etc.)	76%
	C. Protecting Landscapes During Drought	72%
	D. Water Budgeting	69%
	E. Water-Wise Tips	72%
	F. Other: (describe) *(continued on next page)*	3%

Table 6 (continued)

Built Green®/HBA Practices (2003 List) that are Frequently Implemented	A. Trees and natural features on site protected during construction	76%
	B. Save and reuse all site topsoil where determined valuable by soil analysis	69%
	C. Installed irrigation system includes a soil moisture or rain sensor, or other irrigation efficiency device	34%
	D. Install at least three cubic yards of soil amendment per 1000 square feet of installed landscape area, based on soil analysis	52%
	E. Installed irrigation system is zoned separately for turf and bedding areas, and meets low-volume, non-spray irrigation standards, which includes bubblers and drip emitters, drip irrigation, soaker hose and subsurface irrigation. Does not include micro-spray irrigation.	48%
	F. Turf installed in areas where it can be practically irrigated and maintained. (No narrow strips or steep slopes.) *[Note this is a GreenCO practice as an alternative to option G. below.]*	59%
	G. Less than 50% of installed landscape is cool season turf grass (fescue or bluegrass); remaining landscape area either dedicated to water-wise planting beds or to outdoor living environments.	31%
	H. Principles of Xeriscape are applied to non-turf areas of landscaping.	41%
	I. Areas planted with turf should not exceed a maximum slope of 25%.	48%
	J. Installed bedding areas are mulched to a depth of 3"	41%
	K. Permeable materials comprise 40% of areas for all walkways, patios and driveways	17%
	L. Recycled-content mulch or compost	31%
	M. Rainwater directed toward landscaping needs where practical	17%
	N. Provide a list of drought tolerant plants to homebuyers	28%
	O. Builder incorporates water-wise landscaping on model	34%
	P. Provide homebuyers with at least 3 sample water-wise landscaping and irrigation sketch plans (when landscaping is not installed)	7%
Cost/Benefit Data	Are cost/benefit data available for listed practices? (yes/no)	24%

In summary, the majority of builders surveyed indicated that they implemented a variety of approaches such as providing educational materials to homebuyers, installing Xeriscape and water-efficient irrigation systems at model homes, and using water-conservation oriented specifications at new homes and common areas. Approximately 15 percent of builders had written company policies providing specific guidance on water conserving landscaping practices. Roughly one-third of builders had no standard practices or policies in place with regard to landscape conservation.

In order to determine what types of landscape water conservation practices builders were implementing, the landscape-related water conservation practices on the 2003 Built Green® Checklist were provided to assess builder practices. The most commonly implemented practices were protection of trees and natural features during construction and saving and reusing topsoil, as identified by 70-75% of those surveyed. About half of the builders provided at least 3 cubic yards of soil amendment per 1,000 sq. ft. area, installed efficient irrigation systems (i.e., hyrozones, drip), and installed turf in practical areas (i.e., avoided steep slopes or narrow strips). Slightly less than half (40%) of the builders implemented Xeriscape principles and mulched planting areas to a minimum depth of 3 inches. About one-third of the builders provided irrigation efficiency devices (e.g., rain shut-off devices), installed low-water plants/outdoor living areas in half of the landscaped area, provided a list of drought-tolerant plants to homebuyers and incorporated water-wise landscaping at model homes. Around 15-20% of builders directed stormwater runoff to landscaped areas or provided for infiltration through installation of permeable walkways, patios or driveways. Few builders provided example water-wise landscaping and sketch plans to homebuyers. With regard to these practices implemented by builders, only about 25% had cost data readily available to document these practices.

About half of the builders surveyed showed interest in water-wise written specifications and/or guidance on soil amendment, irrigation system design and installation, tree protection during construction, turf installation and water budgeting. About one-third were interested in model landscape maintenance contracts.

The majority (65-75%) of those surveyed were interested in providing educational brochures to homeowners on topics such as Xeriscaping, lawn care, protecting landscapes during drought, water budgeting and water-wise tips. More than half of those responding were interested in attending a water-wise landscaping course or presentation if offered by HBA.

Provided that the survey results are considered to be representative of HBA builders, then the responses indicate that the majority of HBA builders are interested in landscape water conservation and are seeking additional information on the subject.

BUILDER LANDSCAPE WATER CONSERVATION AND WATER QUALITY PROTECTION CASE STUDIES

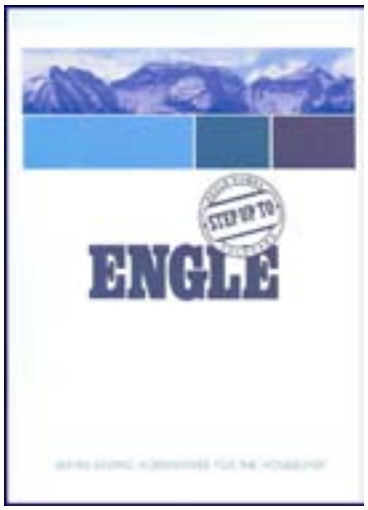
To assess how builders are going about promoting and/or implementing water conservation and water quality protection, several homebuilders were contacted to participate as case studies. The goals of the case studies were two-fold:

1) Assess what water conservation practices builders are implementing.

2) Share these approaches with the broader builder community to demonstrate how water conservation and water quality protection can be effectively integrated into builder practices.

The three builders selected included Engle Homes, McStain Neighborhoods and Village Homes. The landscape practices used by these builders vary and provide a good snapshot into the range of practices being implemented by builders in the metro-Denver area. Highlights of the builder case studies follow. Additional information is provided in Attachment A, which summarizes the case study findings in the form of a Powerpoint presentation.

Engle Homes



Engle Homes has taken a proactive approach to water conservation due to the 2003 drought restrictions across the Front Range. Moreover, Engle desired to educate its buyers about Colorado's semi-arid climate and appropriate landscaping for the Colorado Front Range. Engle's concept was to create a "Water-Wise Program" in conjunction with its "High Performance Homes" to combine interior and exterior water use efficiency and to provide a "Step-Up" in buyer choice.

As part of Engle's Water-Wise Program, they created a water-wise booklet with Valerian, llc, to provide buyers with information regarding Xeriscape, soil preparation, hydrozoning, efficient irrigation, mulching, appropriate

maintenance and drought-tolerant plants. The booklet also provides five alternative backyard Xeriscape designs that buyers can request to have Engle's subcontractors install, hire their own subcontractor, or use the designs for their own landscaping. The costs of the backyard designs were also calculated and included in the water-wise booklet. A summary of these costs is provided in Table 7.

Table 7
Summary of Costs for Alternative Backyard Xeriscape Designs
(Source: Valerian, llc and Engle Homes 2003)

Backyard Design	Lot Size	Traditional Landscape	Xeriscape Landscape	Backyard Landscape Cost	
	Sq. Ft.	(gallons/ year)	(gallons/ year)		
A	4,675	15,675	8,360	$	11,764
B	11,040	28,045	14,844	$	29,875
C	8,050	124,030	76,315	$	20,100
D	11,967	63,477	25,728	$	30,885
E	11,967	147,190	88,096	$	30,885
F	13,350	159,577	52,304	$	39,439

Engle's Water-Wise Committee met with its vendors on several occasions to obtain feedback and buy-in to the program. Missouri Mules and D&S Landscaping were given the task of working with Engle to create front yards that were not "cookie cutter" designs. Engle Homes asked them to vary the trees and shrubs on each lot and to vary the locations of bed areas in an effort to promote Xeriscape design and prove to buyers that Xeriscaping can be appealing.

In addition to developing educational materials and providing backyard landscaping alternatives, Engle Homes completes front yard landscaping in most of its projects. The water-wise standards for these installations include:

- Soil amendments are added (3 c.y. per 1000 sf).
- Irrigated turf is limited to 50% to 60% of the total landscape area.
- Balance of yard planted in drought tolerant bedding areas and rock or wood mulches.

- Use of drought tolerant trees and shrubs.
- Drip irrigation zones are installed for shrub beds.
- Rain sensors are installed standard to curtail irrigation during natural precipitation.

In June of 2003, Brighton Crossing was the first project where Engle Homes implemented its new front yard design, which at the time included 100% rock mulch on the small side of the front yard. After review by its Water-Wise Committee and vendors, and comments from prospective buyers, Engle decided it had to modify its design to include turf areas on both sides of the driveway in addition to the rock/wood mulch bed areas because the original design had created a "sea" of rock.

One of the biggest struggles in sticking with this program was justifying the cost. The basic front yard landscape design adds approximately $2,500 per lot minimum; therefore, increasing the base price of Engle's homes. After much discussion and delay to determine if this was the right decision, Engle Homes felt obligated to provide this as a service to its customers, and with its vendors assistance, Engle Homes was able to finalize its water-wise booklet in August of 2003 and implement its standards in approximately 50% of its projects. In most jurisdictions, however, drought restrictions were still in place,

EXHIBIT 2. FEEDBACK FROM ENGLE HOMES STAFF ON WATER-WISE PROGRAM

"Overall, our buyers are excited about the steps we've taken to save water. Their initial reaction is in regard to how much money they'll save. Second, they acknowledge that they will be helping the environment. While some buyers have shown interest in backyard landscaping, none have wanted to pursue it."

"Homeowners don't realize the reduced sod, but are thrilled that they are getting more shrubs and the rain sensor. They also like the curved edging in the swales compared to straight edging we used to install."

"We haven't had anyone go with the xeriscape packages. It's a great idea, but just a bit expensive is the only drawback"

"…people seem to be very impressed when I tell them that the sprinkler system with the sensor on it is a standard feature."

"… the customers I've talked with really seem to be pleased with the drip systems and rain sensors. I've had a few comments on the xeriscape info., but their focus hasn't been on landscaping."

limiting landscape installation. Feedback on the program was generally positive from sales staff (See Exhibit 2). In conclusion, Robyn Burson of Engle Homes stated:

> "It is our duty in the industry to recognize that Colorado is a semi-arid climate and to be conscious of Colorado's need to conserve water. Engle Homes recognizes that our Water-Wise Program is a work in progress and is subject to change/improvement as it is able to be implemented it into more of our projects; however, it is a step in the right direction and we hope that more and more buyers recognize the benefits of this program."

McStain Neighborhoods

In 2003, McStain Neighborhoods developed a guidance document called the "McStain Neighborhoods Water Conservation Standards for Common Area and Open Space Landscapes." These standards were based on the following guiding principles:

- Planning and designing for beauty, livability, as well as water conservation and long-term sustainability and integrity of landscape design.
- Soil improvement specific to site.
- Practical use of irrigated turf.
- Innovative irrigation methods.
- Plant selections appropriate to local climate and grouped according to individual water and habitat needs.
- Mulching planting beds to reduce evaporation.
- Maintenance of completed landscape with sound horticultural and water conservation practices.
- Marketing and education to encourage end users to adopt water-wise landscaping principles. (See Exhibit 3.)

Combining all of these principles, McStain has implemented a multi-faceted approach that combines water budgets with Xeriscape design principles, development of maintenance and irrigation specifications for landscape maintenance companies, and education of homeowners with regard to landscape management and expectations.

A few examples of McStain's cutting-edge standards include:

- Water Budgets: The landscape design process should incorporate a general outdoor water budget to be used as a guideline for irrigation design and long-term landscape management. The water budget includes a "Maximum Applied Water Allowance" (MAWA) for landscaping based on evapotranspiration, landscaped area and irrigation efficiency. The water budget should be incorporated into the Homeowner's Association projected budget and fees.
- Irrigation Design Criteria: McStain recognizes that efficient irrigation systems are critical to water conservation and that these systems may have higher upfront costs. Irrigation specifications are provided that consider factors such as irrigation efficiency devices, irrigation designs based on "Estimated Applied Water Use," initial irrigation system audits and other measures.

EXHIBIT 3. MCSTAIN NEIGHBORHOODS: PROMOTING CONSERVATION THROUGH EDUCATION

- Water conservation "White Paper" to sales personnel
- Colorful brochures on drought-tolerant plantings
- Landscaping templates that include recommendations on irrigation design and layouts for different lot types
- Information on alternatives to irrigated turf
- Universal landscape signage program developed for all model homes and sales offices
- Soil moisture sensors (hand-probes) as part of new homeowner gift packet (<$10)
- Posting water conservation ideas and strategic links on website
- Regular updates in newsletter on water conservation efforts
- Water-wise messages in sales offices
- Topics in homeowner manuals and home orientation process
- Water-Wise landscaping seminars

- Landscape Maintenance Criteria: One aspect of McStain's landscape maintenance criteria includes tracking actual water use and comparing these amounts to the original MAWA to ensure that the landscape is not being overwatered.

In addition to on-the-ground practices, McStain recognizes that marketing and education are necessary to encourage end-users to adopt water-wise landscaping principles. Some of these ideas are listed in Exhibit 3.

In order to promote long-term landscape water conservation, McStain has developed both landscape maintenance and irrigation system maintenance specifications so that expectations are clearly defined for contractors. These specifications are also based on water-wise principles.

In addition to the practices listed above that are intended for application in open space areas, McStain has also developed water-wise landscape design guidelines and plant lists for use on individual lots in the High Plains Village in Loveland.

Because McStain's projects following these standards are still in the early phases of development, performance data and potential water cost savings were not available for inclusion in this report.

Village Homes

Village Homes was selected as a case study representative of many builders in the state that follow the guidance of various local governments with regard to landscaping recommendations and modify their landscaping practices accordingly. When Village installs individual lot landscaping, it strives to provide water-conservation oriented specifications for irrigation systems, soil amendment and/or landscape design. Specific practices that are frequently implemented include:

- Trees and natural features on site are protected during construction.
- Site topsoil is saved and stock-piled for reuse where determined valuable by soil analysis.
- Turf is installed in areas where it can be practically irrigated and maintained. (e.g., avoiding narrow strips or steep slopes)
- Areas planted with turf should not exceed a maximum slope of 25 percent.

Village has also employed a variety of new technologies to assist in water conservation such as subsurface irrigation in areas troubled by high exposure and high winds, and providing a warning device to help alert homeowners when drip irrigation systems are malfunctioning. Xeriscape principles have been implemented at some developments.

Village has recognized the importance of homeowner education with regard to the critical role that landscaping practices play in a development, both in terms of community enjoyment and protection of water quality. The Village at Five Parks, which has won the "Community of the Year" award for two years, combines a variety of natural features with five parks that serve as the center of life in these communities. Village has developed flyers on proper landscape maintenance for homeowners to help reduce pollutant loading to lakes and streams in the Five Parks area.

IDENTIFICATION OF NEAR-TERM LANDSCAPE WATER CONSERVATION EDUCATION OPPORTUNITIES WITH HBA

After reviewing builder landscaping practices and the HBA programs that provide landscape water conservation education and comparing these practices with GreenCO's landscape BMPs, multiple opportunities for promoting landscape water conservation with the HBA were identified. These opportunities include:

- Expanding and improving the landscape water conservation practices on the Built Green® Checklist and providing supplemental reference material in the "Guide to the Built Green® Checklist."
- Updating and expanding the materials provided in the HBA Quality Construction Manual.
- Reviewing and commenting on HBA's water policy.
- Developing a lecture/course on landscape water conservation incorporating the builder case studies.
- Providing frequent articles on landscape water conservation in the monthly "On the Waterfront" column in *Homebuilder Magazine*, as well as other periodicals.

Action was taken through funding provided by this grant with regard to each of these opportunities as described below.

Built Green® Checklist

Builders interested in environmentally-responsible building practices are a key audience who would consider implementing landscape water conservation practices. For this reason, significant time was invested in review of the Built Green® Checklist along with the companion "Guide to the Built Green® Checklist" which helps to explain the Built Green® criteria. The Guide to the Built Green® checklist was updated in January 2004. On behalf of GreenCO and with the input of various GreenCO members, WWE provided expanded supplemental information for the practices included on the existing checklist. This work primarily consisted of additional references and supplemental detail on the various practices, consistent with the GreenCO BMPs.

The second step with the Built Green® Checklist was to participate in the formal review of the list criteria, which occurred during March and April of 2004. Working closely with Denver Water and GreenCO members, WWE provided suggested changes to the checklist in terms of content and point assignments. WWE and Denver Water presented these recommendations to the Built Green® Checklist Committee in April and answered questions about the suggested changes, as identified in Table 8. The suggested changes were favorably received by the committee, although the final revised Built Green® Checklist was not yet available for inclusion in this report. Traci D'Alessio of Built Green® has extended an invitation for a GreenCO representative to teach the landscape water conservation section of the checklist at the "Built Green University" offered by the HBA.

Table 8
Suggested Revisions to the Built Green® Checklist Provided by Denver Water and GreenCO Members

	Existing Built Green® Checklist Relevant to Landscaping	GreenCO/Denver Water Recommended Substantive Change	HBA Existing Points	Suggest Revised Points
IXX. RESOURCE CONSERVATION: LAND USE				
179	Trees and natural features on site protected during construction	None	6	6
180	Save and reuse all site topsoil where determined valuable by soil analysis	None	4	4
XXII. RESOURCE CONSERVATION: WATER				
196	Installed irrigation system includes a soil moisture or rain sensor, or other irrigation efficiency device (examples in Guide to the Built Green® Checklist)	Specifically add "ET (evapotranspiration) controllers" to this list. Also add "installed irrigation controllers should allow flexible programming to adjust watering schedules to the needs of the plants."	3	5 (6 pts if real-time ET)
197	Install at least three cubic yards of soil amendment per 1000 square feet of installed landscape area, based on soil analysis	Specify that soil amendment must be rototilled 4-6 inches into the soil.	4	7

(Table cont.)	Existing Built Green® Checklist Relevant to Landscaping	WWE/GreenCO/Denver Water Recommended Substantive Change	HBA Existing Points	Suggest Revised Points
198	Installed irrigation system is zoned separately for turf and bedding areas, and meets low-volume, non-spray irrigation standards, which includes bubblers and drip emitters, drip irrigation, soaker hose and subsurface irrigation. Does not include micro-spray irrigation.	Reword to improve clarity: "Installed irrigation system should be designed for the efficient distribution of water based on hydrozones. Turf and bedding areas should be zoned separately. Shrubs and trees should be irrigated with non-spray irrigation systems. Consider non-spray, low-volume irrigation techniques such as drip irrigation and subsurface irrigation.	3	9
199	Less than 50% of installed landscape is cool season turf grass (fescue or bluegrass); remaining landscape area either dedicated to water-wise planting beds or to outdoor living environments.	Install practical turf areas following Xeriscape principles. Turf should not be installed in narrow strips less than 8 ft wide, on slopes greater than 4:1 or in areas that are difficult to efficiently irrigate and manage.	3	3
200	Principles of Xeriscape are applied to non-turf areas of landscaping. See http://www.water.denver.co.gov/xeriscapeinfo/xeriscapeframe.html for details.	Implement the seven principles of Xeriscape. See http://www.denverwater.org/cons_xeriscape/cons_xeriscapeframe.html for details.	3	15
202	Areas planted with turf should not exceed a maximum slope of 25%.		3	3
203	Installed bedding areas are mulched to a depth of 3"	Suggest 3-6 inches.	3	4
204	Permeable materials comprise 40% of areas for all walkways, patios and driveways		2	2
205	Recycled-content mulch or compost		1	1
206	Rainwater harvested and directed toward landscaping needs where practical	Need to change to "Rainwater directed to landscaped areas no closer than five feet to the building foundation"	1	2
207	Provide a list of drought tolerant plants to homebuyers, and add an additional point if builder incorporates water-wise landscaping on model	Provide the homebuyer with a list of lower water use plants that are grouped according to water needs.	1	2

(Table cont.)	Existing Built Green® Checklist Relevant to Landscaping	WWE/GreenCO/Denver Water Recommended Substantive Change	HBA Existing Points	Suggest Revised Points
208	Provide homebuyers with at least 3 sample water-wise landscaping designs and irrigation sketch plans (when landscaping is not installed)		2	5
New Suggested Criteria				
20xA		Design landscape based on a water budget. Recommended maximum water budget is an average of 15 gal/sq. ft. per year when fully established, in addition to natural precipitation. Provide water budget to homebuyer or make available in HOA documents.		8
20xB		Irrigation system is designed by a Certified Irrigation Designer (CID) and installed by a Certified Irrigation Contractor (CIC) or Certified Landscape Technician (CLT).		2
20xC		Installed irrigation system is certified by Certified Landscape Irrigation Auditor (CLIA).		4
20xD		Irrigation systems are equipped with a master valve.		2
20xE		Pop-up sprinklers are equipped with pressure compensating heads, check valves. All systems should be designed and installed with head-to-head spacing of sprinklers and nozzles with matched precipitation rates for each zone.		5
20xD		Install water-wise landscaping and efficient irrigation systems at model homes, along with appropriate signage identifying these practices.		8

Quality Construction Manual

Based in part on the areas of interest identified in the builder survey responses, a packet of materials was compiled for inclusion in the HBA Quality Construction Manual. Ideally, GreenCO would recommend inclusion of the entire GreenCO Manual in the document, but space does not allow for such a large inclusion. For this reason, the

following excerpts from the GreenCO BMP Manual and GreenCO educational brochures were provided for consideration for inclusion in the manual:

- Overall BMP List from GreenCO BMP Manual with website link for more information
- Irrigation Efficiency BMP
- Landscape Design BMP
- Plant Selection and Placement BMP
- Soil Amendment BMP
- Turf Management BMP
- Water Budgeting BMP
- Woody Plant Care BMP
- Xeriscape BMP
- Brochures to Share with Homebuyers and HOAs
    - Saving Your Water, A Guide to Water Conservation for Yards and Gardens
    - Saving Your Landscape, A Guide to Saving Water and Your Landscape Investment Year-Round
    - Save Our Shade, A Guide to Tree Care in Dry Climates
- Xeriscape information packet from Denver Water (updates older information in manual)

Water-Wise Template/HBA Water Advisory Committee

At the time of this project, the HBA Water Task Force had been dissolved due to its original purposes of developing a water policy and a water-wise template having been fulfilled; therefore, there was not a formal opportunity to review and comment on the HBA water-wise template. Nonetheless, the basic suggestions GreenCO added to the Built Green® Checklist would also apply to the HBA water policies in general, if the

committee was reconvened in the future. The majority of the HBA principles and practices in the water-wise template are consistent with GreenCO's BMPs, with the one exception of the 50 percent turf limitation for landscapes. Instead of using a specific percent turf limitation to reduce water use in landscapes, GreenCO advocates a combination of water budgeting and the Xeriscape principle of practical turf areas stated in the form of two complimentary principles:

- Install practical turf areas following Xeriscape™ principles. Turf should not be installed in narrow strips less than 8 ft wide, on slopes greater than 4:1, or in areas that are difficult to efficiently irrigate and manage.

- Design landscape based on a water budget. Recommended maximum water budget is an average of 15 gal/sq. ft. per year when fully established, in addition to natural precipitation. Provide water budget to homebuyer or make available in HOA documents.

This alternative suggestion would have the effect of reducing higher water use plants (of any kind, not just turf) in a landscape design. The water budget recommendation of 15 gallons/square foot was based primarily on an independent effort by the State of Colorado to develop a Model Landscaping Ordinance. (See "Water Efficient Landscape Design" model ordinance sponsored by the Colorado Department of Local Affairs, Department of Smart Growth (http://www.dola.state.co.us/smartgrowth/) for more information.) In keeping with the Colorado Model Ordinance, GreenCO advocates that water budgeting is a well-rounded, scientifically-supported approach to selecting an appropriate palette of plants for a landscape. This approach eliminates the somewhat arbitrary nature of a percentage limit with regard to actual site water requirements, as illustrated in Table 9 below. All of the alternatives in the table would meet a water budget designed to meet 15 gallons/square foot of water requirement for landscaping, but the percentage of the turf exceeds 50 percent in most cases. For this reason, GreenCO believes that it is better to strive for an overall target for landscape water usage rather than placing restrictions on specific plant types.

Table 9
Example Water Requirements for Different Landscape Plant Combinations

% Turf	Est. Turf Water Use (gal/sq. ft.)	% Other Plant	Other Plant Type	Est. Other Plant Water Use	Overall Water Need (gal/sq. ft.)
50%	20	50%	Medium Water Use Plant	10	15
60%	20	40%	Low Water Use Plant	3	13.2
70%	20	30%	Low Water Use Plant	2	14.6
75%	20	25%	Rock	0	15

*Water requirement categories per Colorado Model Landscape Ordinance.

Developing and Presenting a Course/Lecture on Landscape Water Conservation for Builders

Building on the GreenCO BMPs and the builder case studies, a one-hour landscape water conservation class for builders was developed and presented at Builder Product Night in March 2004, as provided in Attachment A. A modified 20-minute version of this presentation focusing on the role of landscaping in stormwater management was subsequently provided at a stormwater conference sponsored by HBA and others. Finally, a 30-minute presentation corresponding to Built Green Checklist practices was presented on May 26, 2004 at the "Built Green® University." It is estimated that around 65 individuals were reached through the combination of these three presentations:

- "Putting Water Conservation into Practice: Tools and Builder Experiences" presented by Jane Clary, Wright Water Engineers, Scott Holzer, Village Homes, Robyn Burson, Engle Homes and Todd Alexander, McStain Neighborhoods. Presented at HBA Builder Product Night, March 2004.

- "Landscaping Practices and Stormwater: What's the Connection?" presented by Jane Clary and Andrew Earles at the Fourth Annual Stormwater and Erosion Control Conference (The Perfect Storm: The Perfect Solution, Answers To Your Questions About Stormwater Management), April 28, 2004. Sponsored by the Construction Workforce Foundation of Colorado and the Colorado Contractors Association, Associated Landscape Contractors of Colorado, Homebuilders Association of Metro Denver, Associated General Contractors of Colorado,

Hispanic Contractors of Colorado, Colorado Ready Mix Concrete Association, Colorado Rock Products Association and Western Colorado Contractors Association.

- "Built Green® Checklist, Resource Conservation—Water (Outdoor)." Presented by Jane Clary, Wright Water Engineers, Inc. at the Built Green® University. May 26, 2004.

All of the builder representatives involved in development of the course are willing to present the course again and serve on a water panel if HBA chooses to offer a class or future lecture on water conservation. Based on the builder survey results, such a class is expected to be of interest to builders, particularly since the drought in Colorado has continued through 2004.

Publication of Articles in Homebuilder Magazine and Other Periodicals

One of the easiest ways to reach a large audience of builders is through publication of short articles in industry periodicals such as *Homebuilder Magazine.* The monthly "On the Waterfront" column is an on-going excellent opportunity to provide up-to-date water conservation information to builders. Several articles on landscape water conservation drawing upon the case studies and the project as a whole were published in *Homebuilder Magazine* and other publications as follows:

- Clary, J. 2004. "So What is Water Budgeting?" in "On the Waterfront" column in *Homebuilder Magazine.* May.

- Clary, J. and K. Calomino, 2004. "Survey of Homebuilders: How Interested Are Builders in Landscape Water Conservation?" in "On the Waterfront" column in *Homebuilder Magazine,* June. *(at press)*

- Crane, D. and J. Clary. 2004. "HBA Builders Promote Water Conservation with Three Case Studies, in "On the Waterfront" column in *Homebuilder Magazine.* April.

- Colorado Foundation for Water Education, 2004. *Citizen's Guide to Water Conservation. (at press)* Provided three sidebar articles included in the guide including: "Over-watering Can Damage Residential Foundations," "Homebuilders Offer Water-Efficient Landscapes," and "Green Industry Promotes Water Quality and Efficiency."

- Clary, J. 2004. "GreenCO Update: GreenCO Develops BMP training, promotes water budgeting," *Colorado Green Magazine*, Summer 2004. *(at press)*

- O'Brien, B. 2004. "BMPs: What's New for 2004- an interview with Jane Clary of Wright Water Engineers," *GreenCO Update*, Volume 2, May 3, 2004.

CONCLUSIONS AND IDENTIFICATION OF OPPORTUNITIES FOR THE FUTURE

1. Project goals were fulfilled as follows:

    a. Homebuilders and developers were engaged in the promotion and implementation of landscape water conservation guidelines through updates to the Built Green® Checklist, development of an educational lecture incorporating builder experiences, providing supplemental materials for the HBA Quality Construction manual and publication of multiple articles in builder periodicals.

    b. GreenCO partnered with Denver Water, the largest water utility in the metro Denver area, to review and provide suggestions to the Built Green® Checklist and to provide up-to-date brochures to the Quality Construction Manual.

    c. HBA and GreenCO worked together to "spread the word" about BMPs and landscape-related water-use efficiency through a multi-faceted approach as described in this report.

    d. GreenCO offered practical tools and resources for integration into the various HBA programs that address landscape water conservation.

2. As a result of this project, consistency between GreenCO's and HBA's landscape water conservation practices has been increased.

3. In the event that the HBA Water Task Force is reconvened in the future, this project report and information provided to the Built Green® program will help support the efforts of the task force.

4. GreenCO, Denver Water and other water providers should support HBA's water conservation education efforts by continuing to submit articles to the "On the Waterfront" column of *Homebuilder Magazine*.

5. GreenCO should continue to partner with the HBA in course offerings such as the Built Green® University and other future HBA educational course offering, potentially as early as the summer of 2004.

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